

2. The method of claim 1 wherein the step of computing parameters of interest comprises computing the pressure drag, the viscous drag, the base drag, the total drag, the cavitation number, the cavity length, the maximum cavity radius, and the cavity length to maximum radius location.

3. The method of claim 2 wherein the output results step further includes outputting the cavity's disturbance potential, disturbance potential gradient, and pressure coefficient.

4. The method of claim 3 wherein the output results step further comprises outputting all system parameter data, panel locations, and cavitation numbers for each iteration.

5. The method of claim 1 wherein the updating the cavity step comprises the steps of:

calculating the rotation of a boundary element panel
necessary for satisfying the no flow boundary condition
for a panel of interest starting with the boundary
element panel closest to the cavitator;

shifting the aft most point of the panel of interest in the
radial direction for satisfying the calculated
rotation;

moving the foremost point of the next aftward panel to the same radius as the shifted aft most point of the panel of interest; and

continuing calculating, shifting and moving for each panel foremost to aft most until the panel adjacent to the endplate is updated.

6. The method of claim 1 wherein the convergence tolerance comprises a maximum radial displacement for each panel.

7. A method for calculating cavity length for an axisymmetric partially cavitating body having a cavitator located at the foremost end, said method comprising the steps of:

receiving system parameter data including geometric data describing the axisymmetric body, a cavitation number, a convergence tolerance, a cavitation number tolerance, and an initial cavity shape including an endplate height, an endplate location, and a cavity length;

initially distributing boundary element panels along the initial cavity shape, endplate and the axisymmetric body aft of the endplate;

initializing matrices for each boundary element panel using the disturbance potentials at the boundary element panels utilizing known boundary values;

formulating disturbance potential matrices for each boundary element panel utilizing disturbance potential equations and no net flux boundary conditions;

solving initialized matrices and formulated disturbance potential matrices for each boundary panel to obtain unknown panel sources, unknown dipoles and unknown cavitation numbers;

computing forces and velocities at each panel from the panel sources, dipoles and cavitation numbers to obtain velocity components, pressure drag, viscous drag, and base drag;

updating the cavity by moving each panel in accordance with the calculated forces and velocities and the boundary conditions;

testing for convergence by comparing the movement of each panel against the convergence tolerance;

iterating said steps of initializing matrices, formulating matrices, solving formulated matrices, computing forces and velocities, updating the cavity and testing for convergence when said test for convergence indicates that movement of at least one panel exceeds the convergence tolerance;

computing a current cavity and a current cavitation number
when said test for convergence indicates that movement
of all said panels are within the convergence
tolerance;

indicating cavitation number convergence when said current
cavitation number is within the cavitation number
tolerance from the received cavitation number;

increasing said cavity length to provide a new cavity length
when said current cavitation number is less than said
received cavitation number beyond the cavitation number
tolerance;

decreasing said cavity length to provide a new cavity length
when said current cavitation number is greater than
said received cavitation number beyond the cavitation
number tolerance;

iterating the steps of initially distributing, initializing
matrices, formulating disturbance potential matrices,
solving initialized matrices and formulated disturbance
potential matrices, computing forces and velocities,
updating the cavity, testing for convergence,
iterating, and computing a current cavity and a current
cavitation number using said new cavity length when
cavitation number convergence is not indicated;

computing parameters of interest when cavitation number
convergence is indicated; and
outputting the location of the cavity and the computed
parameters.

8. The method of claim 7 wherein the step of computing
parameters of interest comprises computing the pressure drag, the
viscous drag, the base drag, the total drag, the maximum cavity
radius, and the cavity length to maximum radius location.

9. The method of claim 8 wherein the output results step further
includes outputting the cavity's disturbance potential,
disturbance potential gradient, and pressure coefficient.

10. The method of claim 9 wherein the output results step
further comprises outputting all system parameter data, panel
locations, and cavitation numbers for each iteration.

11. The method of claim 7 wherein the updating the cavity step
comprises the steps of:

calculating the rotation of a boundary element panel
necessary for satisfying the no flow boundary condition
for a panel of interest starting with the boundary
element panel closest to the cavitator;

shifting the aft most point of the panel of interest in the radial direction for satisfying the calculated rotation;

moving the foremost point of the next aftward panel to the same radius as the shifted aft most point of the panel of interest; and

continuing calculating, shifting and moving for each panel foremost to aft most until the panel adjacent to the endplate is updated.

12. The method of claim 7 wherein the convergence tolerance comprises a maximum radial displacement for each panel.